

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

STOVER, James, M.  
NCR Corporation  
101 W. Schantz Avenue  
Dayton, OH 45479  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 23 February 2001 (23.02.01)	<b>IMPORTANT NOTIFICATION</b>  International filing date (day/month/year) 01 October 1999 (01.10.99)
Applicant's or agent's file reference 8224-PCT	
International application No. PCT/US99/22995	

1. The following indications appeared on record concerning: <input type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input checked="" type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address GATES, George, H. Gates & Cooper Suite 1050 6701 Center Drive West Los Angeles, CA 90045 United States of America	State of Nationality	State of Residence
	Telephone No. 310 642 4146	
	Facsimile No. 310 641 8798	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input type="checkbox"/> the person <input checked="" type="checkbox"/> the name <input type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address GATES, George, H. Gates & Cooper LLP Suite 1050 6701 Center Drive West Los Angeles, CA 90045 United States of America	State of Nationality	State of Residence
	Telephone No. 310 642 4146	
	Facsimile No. 310 641 8798	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to: <input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the designated Offices concerned <input type="checkbox"/> the International Searching Authority <input checked="" type="checkbox"/> the elected Offices concerned <input checked="" type="checkbox"/> the International Preliminary Examining Authority <input type="checkbox"/> other:		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Simin Baharlou  Telephone No.: (41-22) 338.83.38
---	--

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 26 June 2000 (26.06.00)	
<b>International application No.</b> PCT/US99/22995	<b>Applicant's or agent's file reference</b> 8224-PCT
<b>International filing date (day/month/year)</b> 01 October 1999 (01.10.99)	<b>Priority date (day/month/year)</b> 02 October 1998 (02.10.98)
<b>Applicant</b> MILLER, Timothy, Edward et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

06 April 2000 (06.04.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer</p> <p>R. Forax</p> <p>Telephone No.: (41-22) 338.83.38</p>
--	---

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US99/22995

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : G06F 17/30

US CL : 707/3

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/2, 3, 6, 12, 16, 100

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
STN (data mining (p)relational database#; relational database#(p)(api or application programming interface))**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 5,787,425 A (BIGUS) 28 July 1998 (28.07.1998), column 12, lines 19-44.	1-23
Y,P	US 5,787,413 A (KAUFFMAN et al) 28 July 1998 (28.07.1998), abstract, column 10, lines 37-49.	1-23

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"T" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;"

document member of the same patent family

Date of the actual completion of the international search

15 December 1999 (15.12.1999)

Date of mailing of the international search report

03 FEB 2000

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703)305-3230

Authorized officer

Gail O Hayes

Telephone No. 703 306-5539

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 30 MAR 2001

PCT

PCT

Applicant's or agent's file reference 8224-PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/22995	International filing date (day/month/year) 01 OCTOBER 1999	Priority date (day/month/year) 02 OCTOBER 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): G06F 17/30 and US Cl.: 707/3		
Applicant NCR CORPORATION		

RECEIVED

AUG 20 2001

Technology Center 2100

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  06 APRIL 2000	Date of completion of this report  12 MARCH 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer <i>Cam Y Truong</i> CAM Y TRUONG
Facsimile No. (703) 305-3230	Telephone No. (703) 605-1169

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/22995

## I. Basis of the report

### 1. With regard to the elements of the international application:\*

☐ the international application as originally filed

☒ the description:

pages (See Attached) , as originally filed  
pages , filed with the demand  
pages , filed with the letter of

☒ the claims:

pages (See Attached) , as originally filed  
pages , as amended (together with any statement) under Article 19  
pages , filed with the demand  
pages , filed with the letter of

☒ the drawings:

pages (See Attached) , as originally filed  
pages , filed with the demand  
pages , filed with the letter of

☒ the sequence listing part of the description:

pages (See Attached) , as originally filed  
pages , filed with the demand  
pages , filed with the letter of

### 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

### 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

### 4. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages NO

☒ the claims, Nos. 5

☒ the drawings, sheets/fig NO

### 5. ☒ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\*Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/22995

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

Novelty (N)	Claims <u>1-22</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>2-21</u>	YES
	Claims <u>1, 22</u>	NO
Industrial Applicability (IA)	Claims <u>1-22</u>	YES
	Claims <u>NONE</u>	NO

**2. citations and explanations (Rule 70.7)**

Claims 1 and 22 lack an inventive step under PCT Article 33(3) as being obvious over Bigus (U.S. 5,787,425) in view of Kauffman et al. (U.S. 5,787,413).

Bigus discloses a system for performing data mining applications comprising a computer having one or more data storage devices connected thereto, wherein a relational database is stored on one or more of the data storage devices and a relational database management system, executed by the computer, for accessing the relational database stored on the data storage devices (column 12, lines 19-44). Bigus does not disclose an analytic application programming interface (API) that generates a set of scalable data mining functions. Kauffman discloses this limitation (column 10, lines 37-49). Bigus also discloses the claimed set of scalable data mining functions including queries for execution by the relational database management system (column 12, lines 23-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bigus to use an API to generate a set of scalable data mining functions by incorporating the teachings of Kauffman to increase the efficiency of data mining applications.

----- NEW CITATIONS -----  
NONE

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**I. BASIS OF REPORT:**

This report has been drawn on the basis of the description,  
page(s) 1-18, as originally filed.  
page(s) NONE, filed with the demand.  
and additional amendments:  
NONE

This report has been drawn on the basis of the claims,  
page(s) NONE, as originally filed.  
page(s) NONE, as amended under Article 19.  
page(s) NONE, filed with the demand.  
and additional amendments:  
Pages 19-23, filed with the letter of 02 February 2001.

This report has been drawn on the basis of the drawings,  
page(s) 1-5, as originally filed.  
page(s) NO, filed with the demand.  
and additional amendments:  
NO

This report has been drawn on the basis of the sequence listing part of the description:  
page(s) NONE, as originally filed.  
pages(s) NONE, filed with the demand.  
and additional amendments:  
NONE

5. (Some) amendments are considered to go beyond the disclosure as filed:  
NO



02 FEB 2001

## WHAT IS CLAIMED IS:

1. A computer-implemented system for performing data mining applications, comprising:
  - (a) a computer having one or more data storage devices connected thereto,  
5 wherein a relational database is stored on one or more of the data storage devices;
  - (b) a relational database management system, executed by the computer, for accessing the relational database stored on the data storage devices; and
  - (c) an analytic application programming interface (API) that generates a set of  
scalable data mining functions including queries for execution by the relational database  
10 management system, executed by the computer, for performing data mining operations directly within the database management system.
2. The system of claim 1 above, wherein the computer comprises a parallel  
processing computer comprised of a plurality of nodes, and each node executes one or  
15 more threads of the relational database management system to provide parallelism in the data mining operations.
3. The system of claim 1, wherein the scalable data mining functions  
process data collections stored in the relational database and produce results that are  
20 stored in the relational database.
4. The system of claim 1, wherein the scalable data mining functions are  
created by parameterizing and instantiating the analytic API.
- 25 5. The system of claim 1, wherein the scalable data mining functions are  
dynamically generated queries comprised of combined phrases with substituting values  
therein based on parameters supplied to the analytic API.
6. The system of claim 5, wherein the scalable data mining functions are  
30 selected from a group of functions comprising Data Description functions, Data  
Derivation functions, Data Reduction functions, Data Reorganization functions, Data  
Sampling functions, and Data Partitioning functions.
7. The system of claim 6, wherein the Data Description functions comprise  
35 descriptive statistical functions.

8. The system of claim 6, wherein the Data Description functions are selected from a group comprising:

- 5 (1) descriptive statistics for one or more numeric columns, wherein the statistics are selected from a group comprising count, minimum, maximum, mean, standard deviation, standard mean error, variance, coefficient of variance, skewness, kurtosis, uncorrected sum of squares, corrected sum of squares, and quantiles,
- (2) a count of values for a column,
- 10 (3) a calculated modality for a column,
- (4) one or more bin numeric columns of counts with overlay and statistics options,
- (5) one or more automatically sub-binned numeric columns giving additional counts and isolated frequently occurring individual values
- 15 (6) a computed frequency of one or more column values,
- (7) a computed frequency of values for pairs of columns in a column list,
- (8) a Pearson Product-Moment Correlation matrix,
- (9) a Covariance matrix,
- (10) a sum of squares and cross-products matrix, and
- 20 (11) a count of overlapping column values in one or more combinations of tables.

9. The system of claim 6, wherein the Data Derivation functions provide column derivations or transformations.

25

10. The system of claim 6, wherein the Data Description functions are selected from a group comprising:

- (1) a derived binned numeric column wherein a new column is bin number,
- (2) a n-valued categorical column dummy-coded into "n" 0/1 values,
- 30 (3) a n-valued categorical column recoded into n or less new values,
- (4) one or more numeric columns scaled via range transformation,
- (5) one or more columns scaled to a z-score that is a number of standard deviations from a mean,
- (6) one or more numeric columns scaled via a sigmoidal transformation
- 35 function,

- 5 (7) one or more numeric columns scaled via a base 10 logarithm function,  
(8) one or more numeric columns scaled via a natural logarithm function,  
(9) one or more numeric columns scaled via an exponential function,  
(10) one or more numeric columns raised to a specified power,  
(11) one or more numeric columns derived via user defined transformation  
function,  
(12) one or more new columns derived by ranking one or more columns or  
expressions based on order,  
(13) one or more new columns derived with quantile 0 to n-1 based on order  
and n,  
(14) a cumulative sum of a value expression based on a sort expression,  
(15) a moving average of a value expression based on a width and order,  
(16) a moving sum of a value expression based on a width and order,  
(17) a moving difference of a value expression based on a width and order,  
15 (18) a moving linear regression value derived from an expression, width, and  
order,  
(19) a multiple account/product ownership bitmap,  
(20) a product ownership bitmap over multiple time periods,  
(21) one or more counts, amount, percentage means and intensities derived  
from a transaction summary,  
20 (22) one or more variabilities derived from transaction summary data,  
(23) one or more derived trigonometric values and their inverses, including  
sin, arcsin, cos, arccos, csc, arccsc, sec, arcsec, tan, arctan, cot, and arccot,  
and  
25 (24) one or more derived hyperbolic values and their inverses, including sinh,  
arcsinh, cosh, arccosh, csch, arccsch, sech, arcsech, tanh, arctanh, coth,  
and arccoth.

11. The system of claim 6, wherein the Data Reduction functions provide  
30 matrix building operations to reduce the amount of data required for analytic algorithms.

12. The system of claim 6, wherein the Data Reduction functions are selected  
from a group comprising:

AMENDED SHEET

- 5
- (1) build one or more data reduction matrices from a group comprising: (i) a Pearson-Product Moment Correlations matrix; (ii) a Covariances matrix; and (iii) a Sum of Squares and Cross Products (SSCP) matrix,
  - (2) export a resultant matrix, and
  - (3) restart a matrix operation.

10

13. The system of claim 6, wherein the Data Reorganization functions provide an ability to reorganize data by joining or de-normalizing pre-processed results into a wide analytic data set.

14. The system of claim 6, wherein the Data Reorganization functions are selected from a group comprising:
- (1) create a de-normalized new table by removing one or more key columns, and
  - 15 (2) join a plurality of tables or views into a combined result table.

20

15. The system of claim 6, wherein the Data Sampling function provides an ability to construct a new table containing a randomly selected subset of the rows in an existing table or view.

16. The system of claim 6, wherein the Data Sample function selects one or more data samples of specified sizes from a table.

25

17. The system of claim 6, wherein the Data Partitioning function provides an ability to construct a new table containing at least one randomly selected subset of the rows in an existing table or view, wherein the subsets are mutually distinct but all-inclusive subsets of data.

30

18. The system of claim 6, wherein the Data Partitioning function selects one or more data partitions from a table using a database internal hashing technique.

19. The system of claim 1, wherein results of the data mining operations are stored in the relational databases.

20. The system of claim 1, wherein the relational database management system further comprises an analytical logical data model that stores metadata and processing results from the Scalable Data Mining Functions.

- 5 21. A method for performing data mining applications, comprising:
- (a) storing a relational database on one or more data storage devices connected to a computer;
  - (b) accessing the relational database stored on the data storage devices using a relational database management system; and
  - 10 (c) utilizing a comprehensive set of parameterized analytic capabilities for performing data mining operations directly within a massively parallel relational database management system, the set of parameterized analytic capabilities including queries for execution by the relational database management system.

- 15 22. An article of manufacture comprising logic embodying a method for performing data mining applications, comprising:
- (a) storing a relational database on one or more data storage devices connected to a computer;
  - (b) accessing the relational database stored on the data storage devices using a .
  - 20 relational database management system; and
  - (c) utilizing a comprehensive set of parameterized analytic capabilities for performing data mining operations directly within a massively parallel relational database management system, the set of parameterized analytic capabilities including queries for execution by the relational database management system.